

KANTIPUR ENGINEERING COLLEGE

(Affiliated to Tribhuvan University)

Dhapakhel, Lalitpur



[Subject Code: CT755]

A MINOR PROJECT MID-TERM REPORT ON HOUSE PRICE PREDICTION SYSTEM

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**A MINOR PROJECT SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE
OF BACHELOR IN COMPUTER ENGINEERING**

Submitted to:

Department of Computer and Electronics Engineering

February, 2023

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ABSTRACT

The growth of Machine learning has been rapid in this past decade. Many applications evolve in Machine learning day by day. One such application is the house price prediction. Humans are very thoughtful when they want to make investments in a house. The prices for houses have been changing every year that has necessitated the modelling of a house price prediction system. This system will make use of the features of the house such as number of bedrooms available, age of the house, health facility around the area, environment conditions etc. to generate an estimated price for the house with the help of multiple linear regression. The accuracy of the system is checked and improved using loss function and gradient descent.

Keywords— multiple linear regression, house price prediction system, loss function, gradient descent

ACKNOWLEDGMENT

Write Acknowledgment Here. Ea his munere torquatos, quidam essent luptatum cu pro. Ei duo scaevola electram. Vidit percipitur ut vim, ne his solet prodesset inciderint. Cum facilisi sententiae at, vis noster electram contentiones cu. Nec at eius novum diceret.

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CHAPTER 1

INTRODUCTION

1.1 Background

Usually when people want to buy a house, they look for a house which has a reasonable cost, and which has all the desired features they want in the house. The house price prediction will help them to decide whether the house they desire to buy is worth of the price or not. Similar is the case with people who want to sell the house. By making use of the house price prediction system, the seller would be able to decide what all features he/she could add in the house so that the house can be sold for a higher price. [1]

Modelling uses machine learning algorithms, where machine learns from the data and uses them to predict a new data. The most frequently used model for predictive analysis is regression. As we know, the proposed model for accurately predicting future outcomes has applications in economics, business, banking sector, healthcare industry, e-commerce, entertainment, sports etc. One such method used to forecast house prices are based on multiple factors. In metropolitan cities, the prospective home buyer considers several factors such as location, size of the land, road conditions, parking availability and most importantly the house price. Multiple linear regression is one of the statistical techniques for assessing the relationship between the (dependent) target variable and several independent variables. Regression techniques are widely used to build a model based on several factors to predict price. [2]

Multiple linear regression is a statistical technique that can be used to analyse the relationship between a single dependent variable and several independent variables. The objective of multiple linear regression analysis is to use the independent variables whose values are known to predict the value of the single dependent value.

The dataset that we are using contains the data about houses in New Delhi from the year 2019. It contains the following attributes:

Area: Area of the property in square feet

BHK: Number of bedrooms along with 1 hall and 1 kitchen

Bathrooms: Number of bathrooms

Furnishing: Whether listed property is furnished, unfurnished or semi furnished

Locality: Locality in which property lies

Parking: Locality in which property lies

Price: This is the Price of property in INR

Status: Property's status as in 'ready to move' or still under construction

Transaction: It's a new property or being re-sold

Type: It's an Apartment or Builder Floor

1.2 Problem Statement

Prices of real estate properties are sophisticatedly linked with our economy. Despite this, we do not have accurate measures of housing prices based on the vast amount of data available. Therefore, the goal of this project is to use machine learning to predict the selling prices of houses based on many factors.

1.3 Objectives

- To predict house prices on basis of various parameters

1.4 Application Scope

The application scope of our project is in real estate business. Our project will allow the buyer to get an idea of what amount of money he/she has to spend in order to buy the desired house. It will also allow the seller to get information regarding what the estimated worth of house is and how he/she can maximize the profit gained by selling the house.

1.5 Features

- User friendly
- Low cost
- Accurate

1.6 System Requirement

1.6.1 Development Requirement

Hardware Requirement

Ram: 4-8 GB

Processor: 3.5 GHz plus with 4 multicore

Higher Graphics: 2 GB

Software Requirement

HTML, CSS, JS

Python

Jupyter notebook

Matplotlib

Pandas

Numpy

Windows OS

1.7 Feasibility Study

1.7.1 Economic Feasibility

The purpose of the economic feasibility assessment is to determine the positive economic benefits to the user that the proposed system will provide. Most of the software used for the development is free. Thus, the project is economically feasible.

1.7.2 Technical Feasibility

The technical feasibility assessment is focused on gaining in understanding of the present technical resources required by the system and their applicability to the expected needs

of the proposed system. Regarding the proposed system, the technical requirement includes a PC.

1.7.3 Operational Feasibility

The user will not need any former knowledge about programming in order to operate our system .So, our project is operationally feasible.

1.7.4 Schedule Feasibility

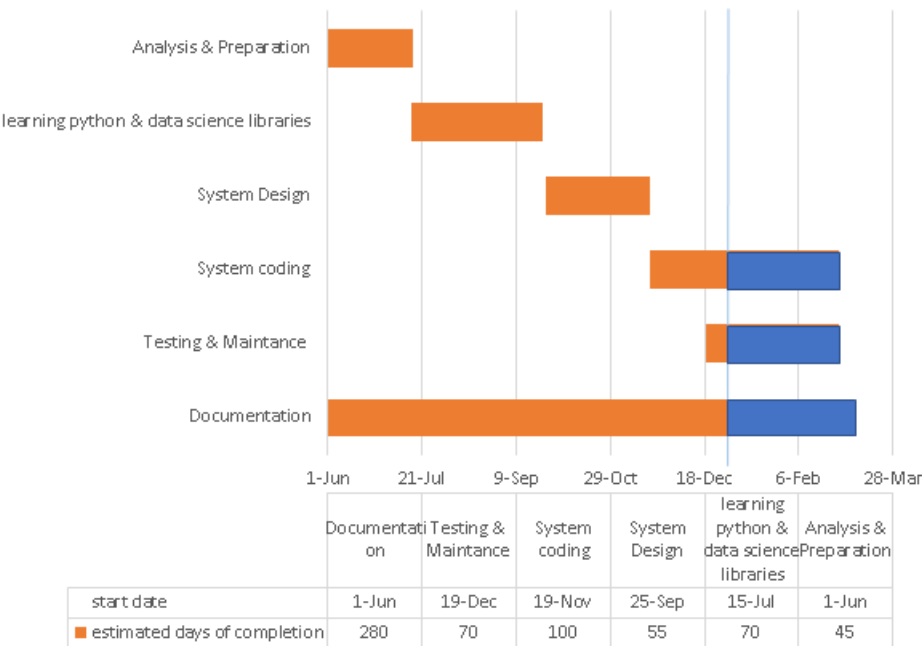


Figure 1.1: Gantt chart

CHAPTER 2

LITERATURE REVIEW

2.1 Related Projects

2.1.1 Zillow

It is a website in which people can buy houses, list houses to sell and the site gives an estimated data for the price of the house.

2.1.2 Rentometer

It is a website that uses proprietary technology and data to provide a thorough rent comparison analysis in seconds. By analysing recent rental listings in the surrounding neighbourhood, Rentometer can calculate rent prices based on location and apartment size, and provide a market rate estimate or lets the user know if he/she is paying too much rent.

2.2 Related Research Works

Anirudh Kaushal and Achyut Shankar researched in detail about house price prediction using multiple linear regression method. In the paper “House Price Prediction Using Multiple Linear Regression” published on April 25, 2021 there is explanation about filtering of data set, data processing, training and evaluating multiple linear regression model.[1] Manasa, J., Gupta, R., & Narahari, N.S. studied and compared the algorithms for estimation of price of houses in city of Bengaluru in the paper “Machine learning based predicting house prices using regression techniques”. [2]

CHAPTER 3

METHODOLOGY

3.0.1 Referring Section

This is an example of referring Section 1.1 of page 1. Lorem ipsum dolor sit amet, diam posidonium efficiantur pri ex, qui aliquip convenire an. Vim falli vivendum ei. Ei per congue sanctus pericula. Mei id tollit mentitum corrumpit. Ad paulo quaerendum eam, meis delenit concludaturque ea nec.

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CHAPTER 4

FIGURES AND TABLES

4.1 Section for Sample Figure

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Figure 4.1: The Sample Image One

4.1.1 Referring Figure

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4.2 Section for Sample Table

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Table 4.1: Table Example

x	3	4	5	5	5
f(x)	111	22	30	40	500

4.2.1 Referring Table

This is an example where Table 4.1 of page 8 is referenced. Detracto suavitate id per, no est putent accusata quaestio, purto quaeque oporteat ei sea. Id eam erat affert, ex has summo inimicus partiendo. Option aliquam imperdiet ius ex. Efficiendi omittantur in mea, id usu tacimates rationibus. Ei accusamus dissentias vix, eos aperiam percipit id.

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4.3 Complex Table from Excel

Complex tables can be created in MS-Excel and latex code for the table can be generated using "excel2latex" add-in. An example of a complex table is shown in Table 4.2 in page 10

you can download excel2latex add-in from

<https://www.ctan.org/tex-archive/support/excel2latex>

Some extra packages are required. like bigstrut, multirow etc. Mea cu vitae noluisse. Tation eirmod iracundia sea no, duo no aliquando elaboraret. Qui ut legere mucius, dolore efficiendi definitionem quo ex. Usu te falli similique posidonium, eum eu dicat aeterno phaedrum, te paulo deleniti ius. Pro te aliquam platonem, eos ea dolore phaedrum. Graece honestatis sit at, nec id ubique legendos. Detracto suavitate id per, no est putent accusata quaestio, purto quaeque oporteat ei sea. Id eam erat affert, ex has summo inimicus partiendo. Option aliquam imperdiet ius ex. Efficiendi omittantur in mea, id usu tacimates rationibus. Ei accusamus dissentias vix, eos aperiam percipit id.

Table 4.2: Complex table converted from Excel using excel2latex

SN	Col 1	Col 2	Col 3		Col 4
1	Merged Cells 1		a	b	e
2			c	d	f
3	Merged Cells 2				
4	abc	Merged Cells 3	a1	a2	
			a3	q	
			a4		as
5	a11				qq
			Merged		

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CHAPTER 5

EQUATIONS

5.1 Basics of Equations

Mathematical expression within text can be written as $y = mx + c$. In separate line as

$$ax + by + c = 0$$

Some latex mathematics examples:

Superscript:

$$x^3$$

$$x^3$$

$$x^{3x+4}$$

$$x^{3x+4^4+5}$$

Subscript:

$$x_{13}$$

$$x_{12}$$

$$x_{123}$$

Greek letters

$$\pi$$

$$\alpha$$

$\alpha A \beta \beta B \delta \gamma \vartheta \Theta \phi \varphi \Phi$ trigonometric: $y = \sin(\pi)$ Log: $y = \log(\pi)$ $y = \ln(\pi)$

$y = \log_{10}$ Square root: $\sqrt{2}$ $\sqrt[3]{4}$ $\sqrt{x^2 + y^2}$ $\sqrt[3]{x^2 + y^2}$ $\sqrt{\sqrt[3]{x^2 + y^2}}$ Fraction: About $\frac{2}{3}$

of the class is full. About $\frac{2}{3}$ of the class is full. About $\frac{2}{3}$ of the class is full. About

$\frac{\sqrt{\sqrt[3]{x^2 + y^2}}}{\sqrt{x^2 + x + 1}}$ of About $\frac{2}{1 + \sqrt{\sqrt[3]{x^2 + y^2}}}$ of the class is full.

Reserved characters: $\{a, b, c\}$ \$20 10%of100is100 10 % of 100 is 100

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 $\left(3(\frac{2}{3}) 3\left(\frac{2}{3}\right)$

Equation:

$$E = mc^2 \tag{5.1}$$

$$E = mc^2$$

$$E = mc^2$$

$$E = mc^2 \tag{5.2}$$

$$E = mc^4 \tag{5.3}$$

$$E = mc^7 \tag{5.4}$$

$$E = mc^2$$

$$E = mc^4$$

$$E \approx \pm (mc^7 + 3)$$

$$E \approx \pm (mc^7 + 3)$$

$$E \; = \; mc^2 \tag{5.5}$$

$$E \; = \; mc^4$$

$$E \; \approx \; \pm (mc^7 + 3) \tag{5.6}$$

Limit: $\lim_{x \rightarrow a} f(x)$

$\lim_{x \rightarrow a} \frac{f(x)-f(a)}{x-a} = f'(a)$ Integration: \int

$\int (\sin x \, dx =)$

$$\int (\sin x \, dx) = \int_a^b (\sin x \, dx) = \int_a^b x^2 \, dx = \left[\frac{x^3}{3} \right]_a^b$$

Summation: $\sum_{n=1}^{10} \int_a^b f(x) \, dx = \lim_{x \rightarrow \infty} \sum_{K=1}^{10} f(x_k) \cdot \delta x$

5.2 Referencing the Equation

The Equation can be referenced using labels. example Equation 5.2 of page 12 is referenced here. LaTeX is the de facto standard for the communication and publication of scientific documents. LaTeX is available as free software.

CHAPTER 6

LISTING EXAMPLES

Here are some examples of listing

Ordered List Technique:

Listing Technique 1:

1. Pencil
2. Paper
3. Calculator
4. Notebook
 - (a) Assignment
 - i. Test
 - A. Test 1
 - B. Test 2
 - ii. Quiz
 - (b) Classwork

Listing Technique 2:

- Pencil
- Paper
- Calculator
- Notebook
 - Assignment
 1. Test
 - * Test 1
 - * Test 2
 2. Quiz
 - Classwork

Listing Technique 3:

1. Pencil
2. Paper
3. Calculator

4. Notebook

A Assignment

I Test

i Test 1

ii Test 2

II Quiz

B Classwork

6.1 The Subsections

LaTeX is a document preparation system for the communication and publication of scientific documents.

It is most often used for medium-to-large technical or scientific documents but it can be used for almost any form of publishing. as said in 1.1 of page no. 1 LaTeX is the de facto standard for the communication and publication of scientific documents. LaTeX is available as free software.

The subsection

LaTeX is a document preparation system for the communication and publication of scientific documents.

It is most often used for medium-to-large technical or scientific documents but it can be used for almost any form of publishing.

LaTeX is the de facto standard for the communication and publication of scientific documents. LaTeX is available as free software.

The paragraph LaTeX is a document preparation system for the communication and publication of scientific documents.

It is most often used for medium-to-large technical or scientific documents but it can be

used for almost any form of publishing.

The subparagraph LaTeX is a document preparation system for the communication and publication of scientific documents.

It is most often used for medium-to-large technical or scientific documents but it can be used for almost any form of publishing.

CHAPTER 7

CITATION EXAMPLE

7.1 Citation and compiling bib file

This is an example of citing texts [?]. This is second citation [?] The first cited reference will be numbered "1", second "2" and so on. Only those cited in the document will be listed in the reference section.

Note that to compile documents with reference correctly, you need to follow following steps:

1. Run pdfLatex (or Quick build)
2. Run Bibtex
3. Run pdflatex 2 times

Tation eirmod iracundia sea no, duo no aliquando elaboraret. Qui ut legere mucius, dolore efficiendi definitionem quo ex. Usu te falli similique posidonium, eum eu dicat aeterno phaedrum, te paulo deleniti ius. Pro te aliquam platonem, eos ea dolore phaedrum. Graece honestatis sit at, nec id ubique legendos. Detracto suavitate id per, no est putent accusata quaestio, purto quaeque oporteat ei sea. Id eam erat affert, ex has summo inimicus partiendo. Option aliquam imperdiet ius ex. Efficiendi omittantur in mea, id usu tacimates rationibus. Ei accusamus dissentias vix, eos aperiam percipit id.

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REFERENCES

APPENDIX

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